

A Thoughtfully Designed Home

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Architecture Narrative

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Build Competition

Kaikaiknong Crescent Development
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Introduction

The Chippewas of Nawash Unceded First Nations community located on the Neyaashiinigmiing Reserve in Southwestern Ontario forms an integral part of the rich tapestry that is Canada's indigenous heritage. Like many Indigenous communities, however, access to adequate housing for all of its members is often a large challenge and one that is not sufficiently addressed by provincial and federal governments. With growing families and the return of community members wishing to live on their lands, the demand for good-quality, affordable housing that meets the needs of each Chippewas of Nawash community member kept rising. As a result, Warrior Home's entry for the Solar Decathlon Build Challenge aimed to address the housing crisis present in Canada's Indigenous communities through the design and construction of a sustainable home that also addresses the cultural and societal needs of the homeowner and community. From 2018 to 2020, Warrior Home has worked closely with the Chippewas of Nawash to design

and build a net-zero energy home that was made to accommodate the specific needs of the residents of the Neyaashiinigmiing Reserve. The team was able to partner with the Habitat for Humanity Grey Bruce to build a net-zero energy home in the Kaikaiknong Crescent development. After extensive consultation with community leaders, community members and the family that was chosen to receive the home, Warrior Home was able to develop an innovative and affordable design that integrates energy efficient technology, high-performance engineering systems as well as aesthetics, ergonomics, and Indigenous culture. By December 2019, students and local volunteers were able to complete the construction of the Warrior Home design and a family of 5 was able to move in.

From a design standpoint, the conceptualization of the home integrated the needs and lifestyle of the family, as well as community insight. The main goal was to create a comfortable, accessible,

and culturally significant design while achieving sustainable and net-zero energy goals. Location and cost constraints prompted the installation of energy efficient technology such as heat pumps and solar panels, as well as the simple and easily reproduced final design. The barrier free, accessible interior spaces and natural light from the north and east facades, as well as passive house principles all contributed to a successful architectural concept.

What fueled the team to complete the design and help build the net-zero energy home were ultimately the wonderful people in the community, which include the housing authority, Chief and Band Council, the homeowners, a mother named Melissa and her four children, and many others met throughout the process. Their unique stories and needs propelled the design for the home, which itself contributed towards the promotion of sustainable development within Indigenous communities in Canada.

This home felt like winning the lottery, it felt better than the lottery!



Melissa Millette
Homeowner



Key Stats:

Location of Permanent Site:

Neyaashiinigmiing Reserve
Ontario, Canada

Client Demographic:

Single Mother of 4
- 1 Infant
- 2 Teenagers
- 1 Adult Aged

Approximate Household Income:

<\$30,000 CAD

Climate Stats:

ASHRAE Climate Zone:

6A

Winter Average Low Temperature:

-35°C (-22°F)

Summer Average High Temperature:

30°C (86°F)

Precipitation:

Up to 4" of Rainfall
Up to 43" of Snow Accumulation

Community Stats:

Population (2017):

615

Existing Housing Stock:

225 Single Detached Homes

25 Semi-Detached Homes

20 Apartment & Duplexes



Architectural Concept and Design Approach

The Warrior Home team's design goals while conceptualizing the home consisted of occupant-oriented design, affordability, as well as resilience. Various facets, from the floorplan, to the materials used in construction, reflect these goals. For instance, floor plans were designed to ensure a balance between natural lighting in all rooms, and a conservative window-to-wall ratio that reduced energy loss. The project was driven by the desire to incorporate passive housing aspects and comfort for the client. Furthermore, the house integrates high-performance solutions throughout the home in conjunction with an occupant-orientated design to

create a suitable affordable home for the community that meets net-zero guidelines. These technologies include HVAC, renewable energy, electrical, architectural, and building enclosure solutions and were all discussed in an integrative design process which saw the architecture team collaborating closely with all other sub-teams and numerous stakeholders to address all the needs of building a unique net-zero house.

Affordability and collaboration with the Habitat for Humanity team was the main priority of the design. This required maintaining constructability, simple

floor plans, as well as adaptability through the design to accommodate the needs of a growing family. The accessibility of the home was an integral part of the team's design approach; this helped to support the home's potential for accommodating multi-generational families and to occupants with physical impairment (Figure 1). Cost-efficient materials were chosen, with floor plans that resulted in spaces that did not require custom items/objects of greater expense. The design of the Warrior Home build separates the common space and the private bedroom space through zoning in the home (Figure 3). This fosters an environment where louder social

gatherings can co-exist with quiet private space. The inclusion of the covered balcony at the front further aligns with the community involvement aspect which the occupants enjoy. It provides a comfortable space where the family can enjoy the outdoor environment, and reconnect with nature. The overall architectural design offers inspiration and delight to the occupants of the home by providing a comfortable, multi-use space that a family can comfortably reside in. By having both gathering and private rooms, various functions and tasks requiring unique environments can be accommodated.

Climatology was an aspect that was highly considered in the building enclosure and renewable energy solutions chosen. The home was designed so that water conservation occurs through rain collection in multiple barrels strategically placed around the building perimeter, as well as an on-site rain garden to treat polluted stormwater runoff.

The addition of landscaped vegetation promotes sustainable agriculture, improves ecology, and reduces water runoff. The generally rectangular shape of the home also aims to minimize the surface area of the external walls and ultimately reduces the thermal losses associated with it. The local climate of Ontario was taken into consideration when it came to the plant selection, water conservation strategies and other landscape features. The plant palette comprises 47 unique plant species native to the region. As perennials, they will not be killed by the winter conditions, and will return year after year. Plants were selected for their durability, low maintenance, functionality and beauty. Placement of vegetation on the site depends on the plant's favor for sun or shade, while seasonal blooming periods are staggered. Deciduous trees near the house provide shade in the summer and shed their leaves in the winter to maximize solar exposure. Water is conserved on-site through the implementation of

two rain barrels, collecting water that falls on the roof and storing it for future garden-watering during dry spells.

Given the site, passive housing design was prioritized by taking full advantage of the landscape building orientation. By having green space, vegetation as well as rain gardens, the promotion of growth and rainwater mitigation was ensured. The building was also strategically orientated to allow maximum solar gain for the solar panels mounted on the roof, as well as to ensure south-facing windows, which encourages an interior ambiance of natural light. In a fairly isolated location, a sense of community can be difficult to achieve. As mentioned previously, two covered entrances were included, as they promote comfortable gathering. In the interior of the home a common space is placed at the entrance, which encourages gatherings and a sense of belonging.

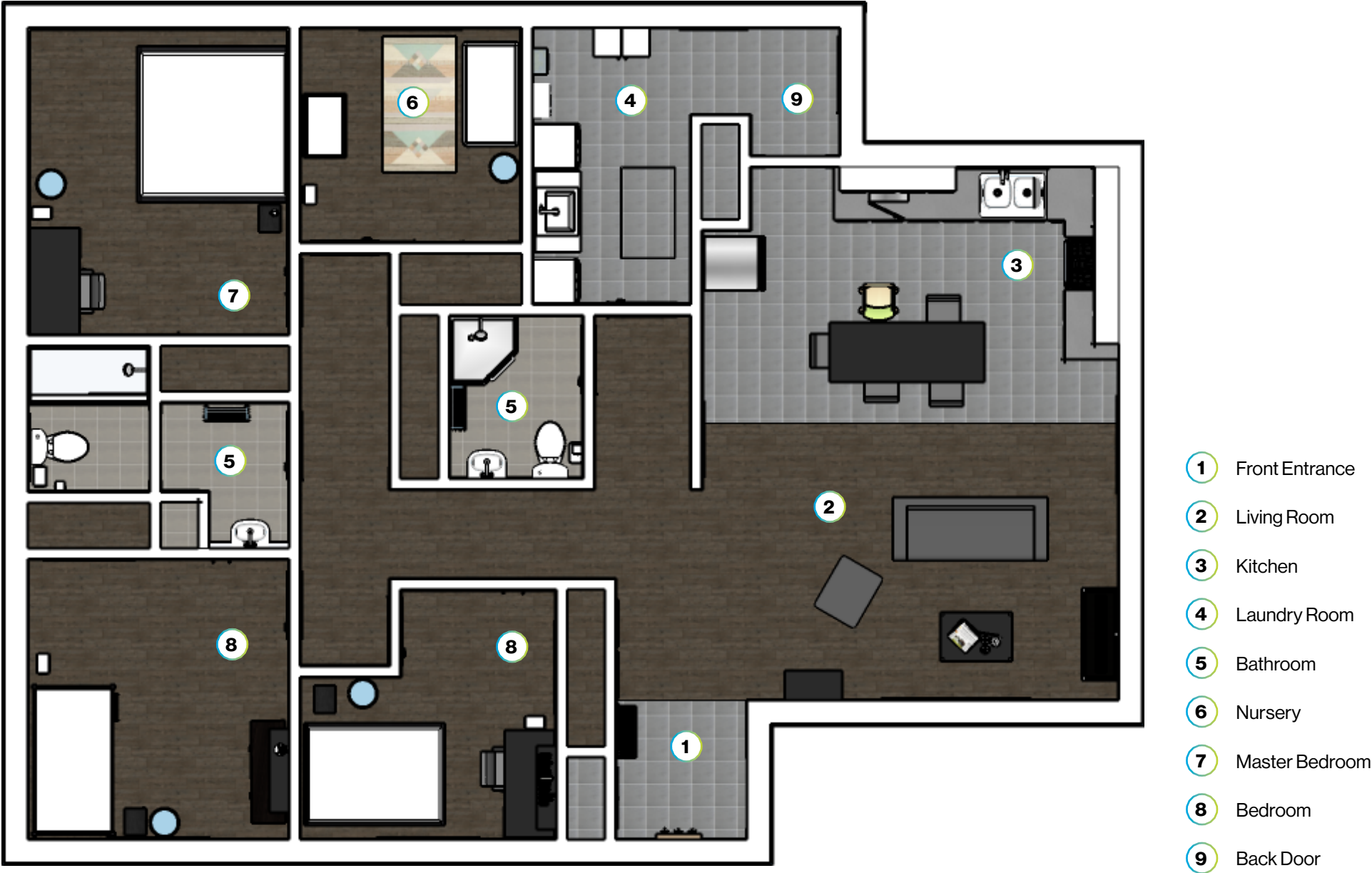


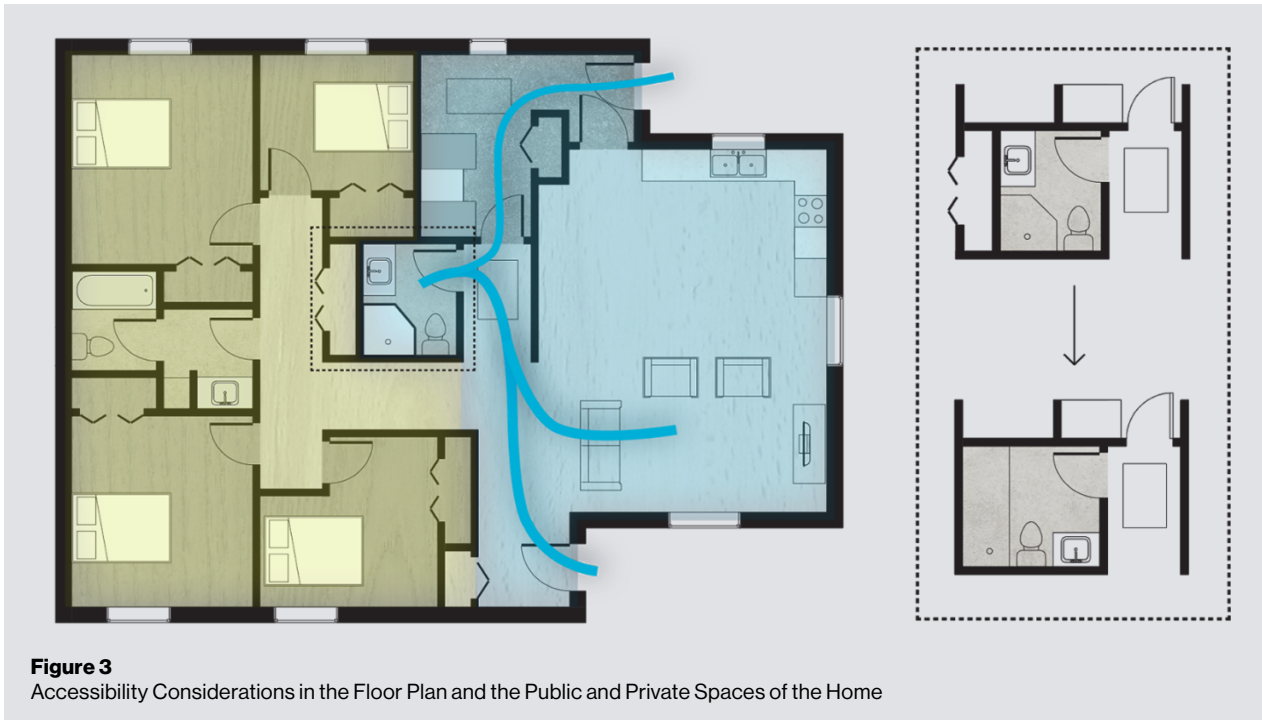
Figure 1
Designed for a Multi-generational Family



Figure 2
Outdoor Spaces that Offer Inspiration and Delight

Floor Plan





Architectural Implementation

The Warrior Home's simple and efficient design was the result of considering various stakeholder needs. To maintain similarity with the other homes in the Habitat for Humanity community, the house facade aimed to be similar to the existing designs. The home was also designed to provide interior and exterior space to host casual conversation and gathering to take family and community needs into consideration. Since the home was built through the help of volunteers, a gable roof was chosen to allow for a simple truss to be lifted on top of the home and make the installation process as simple as possible (Figure 4).



Figure 4
A Gable Roof Allowing a Simple Truss

The interior of the home provides a suitable number of rooms and bathrooms to adapt to various needs. With three rooms and two bathrooms, the family can easily use the rooms for bedroom, play space, or office space. One of the bathrooms and the attached closet is positioned to be adaptable so that accessibility needs can be met if necessary (Figure 5). The bathroom can be expanded and reoriented to include a bathtub or larger shower to enable wheelchair accessibility. The mudroom located near the front and back of the home separate externalities from the comfortable interior living space. It offers a landing pad for occupants to dry off snow, clean up dirt, and put down heavy items before entering a cozy, clean living space.



Figure 4
A Gable Roof Allowing a Simple Truss

In terms of energy efficiency, the design uses minimal external wall surface area to offer greater energy efficiency. The incorporation of solar panels on the south facing roof slope maximizes solar gain, and promotes renewable energy usage. Rain collection and natural forms of water treatment are available on-site, as well as vegetation that creates habitats and promotes sustainable agriculture.

For the solar energy systems implemented in the home, the integrative design process allowed the architecture of the home to be optimized to allow for maximum efficiency. House orientation and the design of the roofing system designed in conjunction with the Solar Energy Team and Electrical Team to ensure that the most optimal solar photo-voltaic system was implemented (Figure 6). An extensive number of additional tools and technologies also add to the energy efficiency of the home, and these are covered in greater detail in the Engineering Narrative (Figure 7). Thanks to the integrative design process, these energy and building science solutions were implemented with ease and integrated seamlessly into the home.



Figure 5
An Optimal Solar Photo-Voltaic System

Inside the home, interior details considered cabinetry, materials, and appliances to ensure that sustainable and adaptable solutions are created. The kitchen is oriented as an L-shape opening to the living room to offer the occupant with as much freedom to customize the common space as possible (Figure 8). An island can be selected for greater seating and dining space, while a larger sofa

can also be placed for comfortable conversations and leisure, which allows the home to be adaptable to any type of family. Materials consider low VOC, resilient, low-flow, and high efficiency options, including LED lighting and EnergyStar appliances. The windows are strategically placed to optimize natural lighting in all rooms, while maintaining a window-to-wall ratio that minimizes energy loss. Two entrances provide easy access to the interior space, while encouraging encounters with the landscaped backyard, ample with vegetation and seating.



Figure 6
Smart Home Integration for Greater Efficiency



Figure 7
An Adaptable Kitchen with Energy Star Appliances

This house demonstrates quality design through the materials, details, and implementation, which can be displayed by the durability and comfort the building entails. The solar panels chosen are resilient to harsh weather conditions. Mechanical equipment was chosen with the future in mind, as they prevent the damage of surrounding materials, allowing them to be used longer and thus reducing financial stress. An example of this is the heat recovery ventilator unit, as it avoids bringing humidity into the home, minimizing the condensation that will gather on windows, and potentially cause interior finishes to deteriorate. The vinyl siding is durable, and easy to both maintain and install (Figure 8). This siding also requires less energy and fuel to manufacture than other common cladding materials, like brick. Two layers of insulation ensure temperature control, and reduce wasted energy that escapes or enters through the building envelope.



Figure 8
Durable Vinyl Siding

Lighting uses windows at the front and back of the home to provide daylight into the home. Windows situated at both the front and back of the open kitchen living space allows for a full view of both sides of the home property. This connects the occupant with nature and the community at the same time and offers ample amounts of daylight. At night, LED lighting solutions were selected to

provide efficient but warm light to foster a welcoming living space. Natural lighting is integrated into the house through strategic window placement that ensures both ambient light from the north as well as direct light from the south. There is a window placed in all bedrooms, washroom and common areas. The bedrooms are equally placed on the north and south sides of the house, allowing variety for those who enjoy cool toned lighting, or more direct sunlight. The sizing of the windows allow for ample lighting, while being of a size that reduces thermal bridging and heat loss (Figure 9). Daylighting and electrical lighting considerations were an integral part of the overall design process; with the team's integrative design process, the electrical components necessary for lighting were able to be integrated seamlessly into the home.



Figure 9
Large Windows

The specified location of the overall subdivision provides occupants with a convenient and community-oriented place to live. The location of the Warrior Home house also allows community members to conveniently access schools, social services, community spaces and workplaces on the reserve. The location of the subdivision on the reserve is something that has attracted the Chippewas of Nawash diaspora to return to their reserve to be closer to their families and the

community-specific resources offered on the reserve. The specified site of the home provides the family living there with an ample backyard that is well suited to the needs of a family with children. The backyard could accommodate a variety of family-friendly amenities such as a garden or play structure. As mentioned above, the landscaping of the home was developed with a careful consideration of what is regionally appropriate; native species and resilient, sustainable planting choices were made. The drainage and grading of the site were also well implemented; prior to the start of construction, the site was cleared and a firm was engaged to implement industry standard grading and drainage systems on the site.



Documentation

The documentation and deliverables presented by the Warrior Home design team provide the jury with ample justification for the design of the home. The energy modelling, conceptual diagrams, site layouts, material breakdowns, preliminary product specifications (EnergyStar), as built drawings, and other deliverables submitted all aim to help the jury understand the decisions made given the context of Warrior Home's build project. In particular, the drawing set submitted by Warrior Home, which is over 100 pages in length, provides exceptional clarity and illustrates the most complex elements of the home in great detail. The deliverables submitted by Warrior Home not only provide the jury with a means to perform an effective evaluation, it also enhances the reproducibility of the home and includes helpful details on complex procedures such as window installation which can be especially helpful in the context of Warrior Home's volunteer build.

The competition drawings clearly reveal the intent of the design, and show how goals were achieved through materials, construction and layout. The opening render displays the clear vision of the home, and allows the audience to know the aesthetics and position of the building. These factors are further emphasized through the proposed site plans that follow in the package. The floor plan layout, along with the exhibit logistics clearly show the placement of rooms and interior finishes in the space, and how the space can be used to ensure maximum comfort. Electrical, plumbing and mechanical schemes are included, to satisfy MEP needs and ensure successful application of all systems. Enclosure and assembly details, along with window installation aid greatly in the construction process, and ensure that labourers are aware of the required materials in their locations. Elevations and the roof plan act as additional visual guides to the renders,

allowing the audience to understand window, door, and solar panel placements, which were all done strategically to maximize solar gain and natural light. This working set of drawings utilizes the needed views, correct line weights, and ample callouts to enhance knowledge on the design, meaning that the audience is aware of the home's intent, and how it will accomplish the desired goals.



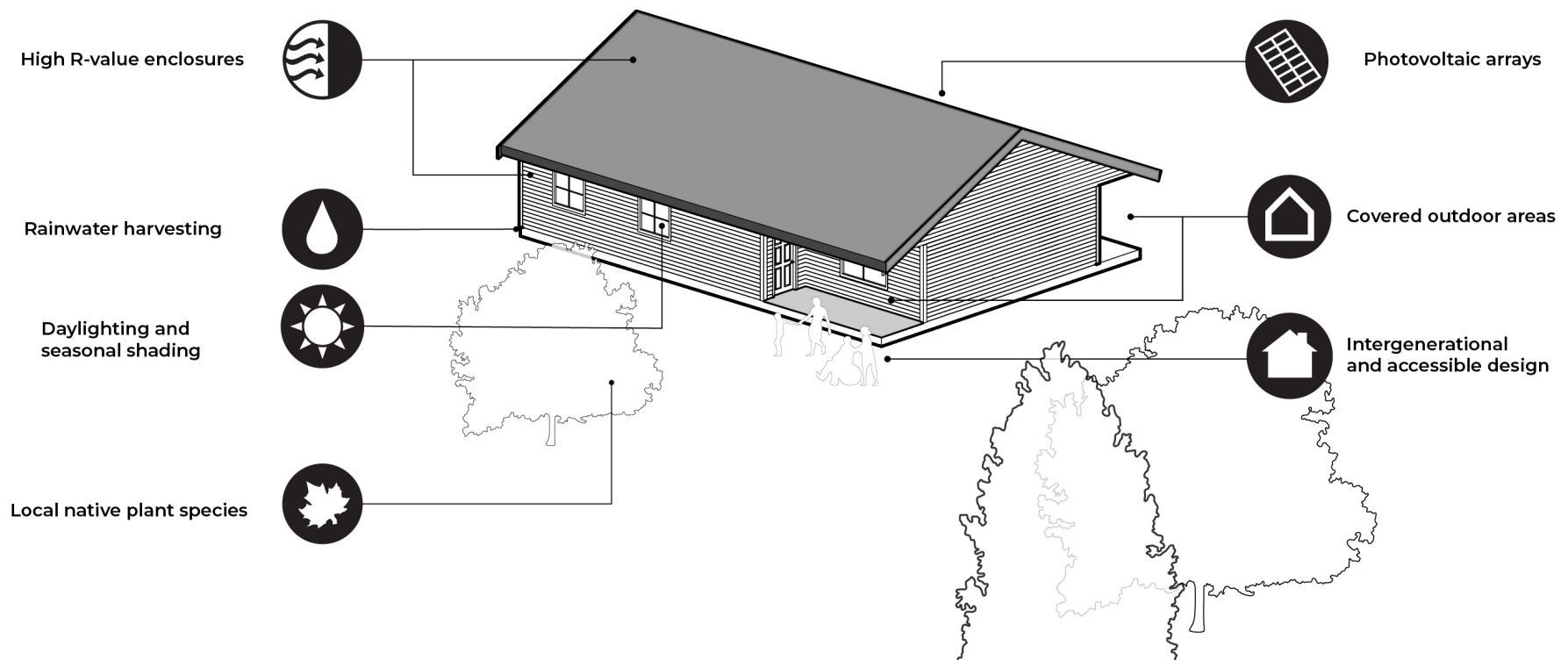
Architectural Innovation

The main architectural innovations for the Warrior Home build were in its integrative and collaborative design process. The Warrior Home architecture team worked hand-in-hand with all of the other teams including the structural and building envelope sub-teams to construct a home that featured the seamless integration of innovative systems not found in many other homes. Building envelope, HVAC and solar energy systems were all examples of elements that were taken into consideration early on in the design phase. Warrior Home's holistic approach towards the architectural design of the home is also well reflected through the home's ability to accommodate the specific needs of the family

residing in the home. This was only possible through a careful understanding of the cultural norms and accessibility related needs that the team carefully developed through transparent collaboration with both the community and the incoming homeowner. One way in which the home reflected this understanding was in the zoning out of private and shared spaces in the home - this was meant to reflect the team's holistic understanding of both the family's unique needs and the community's fondness for intergenerational housing.

Warrior Home was able to build an innovative new home for a deserving family that would almost

certainly not have been able to implement a net-zero home on their own. Warrior Home was able to design and implement an in effect almost custom, net-zero energy home that is leaps and bounds more innovative, sustainable and comfortable than other similarly priced homes. In doing so, Warrior Home's build became the first net-zero energy Habitat for Humanity built home on an Indigenous reserve in Canada. The Warrior Home build represents a much needed, innovative and sustainable step forward for an underserved community.



Conclusion

In conclusion, the architectural design of the Warrior Home build Warrior Home's entry for the Solar Decathlon Build Challenge achieves the goal of providing a comfortable, attractive and sustainable home in a unique locational context to a family that needs it the most. This laudable goal was achieved through Warrior Home's careful iterative and integrative design process. It is clear that the finished home reflected a thorough understanding of the needs of the clients and demonstrated a well synchronized, collaborative effort across the entire Warrior Home team.



When community members are housed in energy-efficient dwellings, other issues are addressed. Issues of security, of children going to school and feeling good. It addresses self-esteem. It addresses so much more than just being in shelter.



Greg Nadjiwon
Chief, Chippewas of Nawash

Designed and Built for an Affordable and Sustainable Future



Appendix A: Architectural Photography

Note: Although the house has been occupied for more than a year, opportunities for photography have been limited due to the COVID-19 Pandemic. Ontario's Indigenous Reserves were closed to visitors at the start of the pandemic and remain closed in order to protect the province's vulnerable Indigenous population. As such, construction photos, occupied interior photos, and renderings will be submitted.

Exterior Photos



Exterior Photos



Exterior Photos



Exterior Renderings



Interior Photos



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